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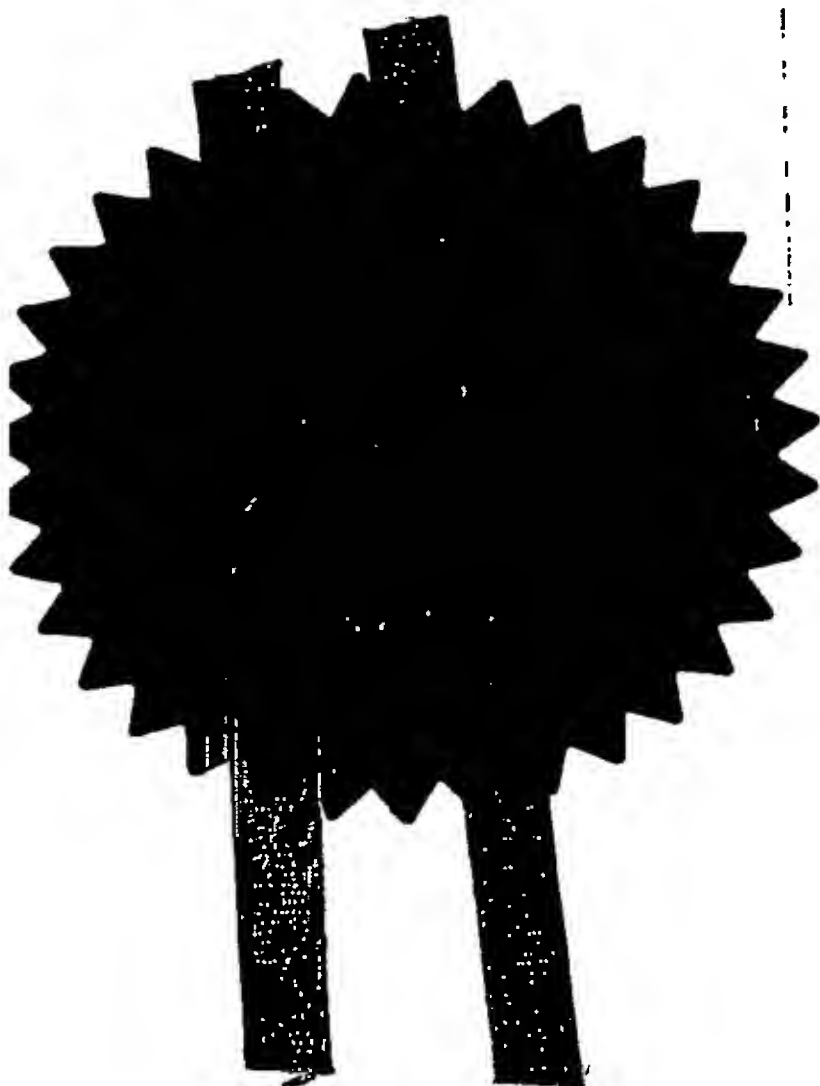
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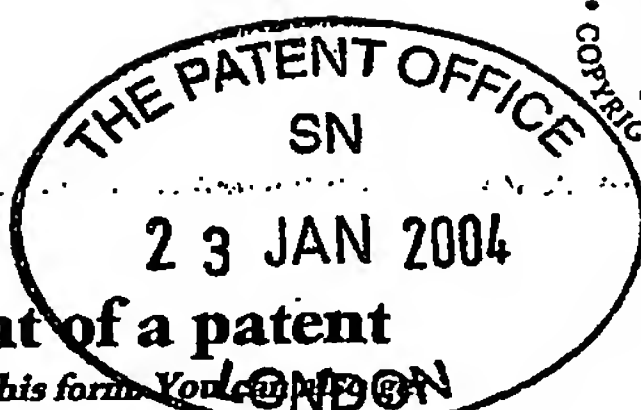
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Dated 15 December 2004



**Patents Form 1/77**

Patents Act 1977  
16



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P01/7700 0.00-0401484.1 ACCOUNT CHA

**Request for grant of a patent**

(See the notes on the back of this form. You can also find an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road  
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NP10 8QQ

1. Your reference	M03B327/ASB		
2. Patent application number (The Patent Office will fill this part in)	0401484.1		23 JAN 2004
3. Full name, address and postcode of the or of each applicant (underline all surnames)	The BOC Group plc, Chertsey Road, Windlesham, Surrey, GU20 6HJ		
Patents ADP number (if you know it)	884627002 /		
If the applicant is a corporate body, give the country/state of its incorporation	England		
4. Title of the invention	SCREW PUMP		
5. Name of your agent (if you have one)	Andrew Steven BOOTH		
"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)	The BOC Group plc, Chertsey Road, Windlesham, Surrey, GU20 6HJ		
Patents ADP number (if you know it)			
6. Priority: Complete this section if you are declaring priority from one or more earlier patent applications, filed in the last 12 months.	Country	Priority application number (if you know it)	Date of filing (day / month / year)
7. Divisionals, etc: Complete this section only if this application is a divisional application or resulted from an entitlement dispute (see note f)	Number of earlier UK application		Date of filing (day / month / year)
8. Is a Patents Form 7/77 (Statement of inventorship and of right to grant of a patent) required in support of this request?	Yes		
Answer YES if:			
a) any applicant named in part 3 is not an inventor, or			
b) there is an inventor who is not named as an applicant, or			
c) any named applicant is a corporate body.			
Otherwise answer NO (See note d)			

## Patents Form 1/77

Accompanying documents: A patent application must include a description of the invention.

Not counting duplicates, please enter the number of pages of each item accompanying this form:

Continuation sheets of this form

0

4

Description

2

Claim(s)

1

Abstract

Drawing(s)

1 + 132

10. If you are also filing any of the following, state how many against each item.

Priority documents

0

Translations of priority documents

0

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

0

Request for a preliminary examination and search (Patents Form 9/77)

1

Request for a substantive examination (Patents Form 10/77)

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Any other documents (please specify)

0

11. I/We request the grant of a patent on the basis of this application.

Signature(s)

A S Booth

Date

23/01/2004

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom

Andrew Steven Booth  
(01276) 807612

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- If you have answered YES in part 8, a Patents Form 7/77 will need to be filed.
- Once you have filled in the form you must remember to sign and date it.
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SCREW PUMP

DUPLICATE

The invention relates to a screw pump.

5 A screw pump comprising two externally threaded rotors mounted in a pump body and adapted for counter-rotation in the body with intermeshing of the rotor threads is well known. Close tolerances between the rotor threads at the points of intermeshing and with the internal surfaces of the pump body cause volumes of gas being pumped between an inlet and an outlet to be trapped between the  
10 threads of the rotors and the internal surface of the pump body and thereby urged through the pump as the rotors rotate.

Such screw pumps are potentially attractive because they can be manufactured with few working components and they have an ability to pump from a high  
15 vacuum environment at the pump inlet down to atmospheric pressure at the pump outlet. As a result, a screw pump may be employed as a backing pump for a secondary pump, such as a turbomolecular pump, for evacuating a process tool.

If a screw pump has a sufficiently high capacity, two turbomolecular pumps could  
20 be simultaneously backed by a single screw pump by connecting the exhausts of the turbomolecular pumps to the inlet of the screw pump via a common backing line. However, in such an arrangement, any variation in the flow rate of pumped gas exhaust from one of the turbomolecular pumps could change the fluid pressure within the common backing line, which in turn would affect the  
25 performance of the other turbomolecular pump exhausting into the common backing line. In view of this, typically each secondary pump is backed by a respective pump.

It is an aim of at least the preferred embodiment of the present invention to provide  
30 an improved screw pump which can simultaneously back two pumps whilst substantially avoiding the aforementioned problem.

In a first aspect, the present invention provides a screw pump comprising a chamber defining with first and second externally threaded rotors mounted on respective shafts and adapted for counter-rotation within the chamber a plurality of flow paths having respective fluid inlets.

5 By providing two inlets for the chamber, separate flow paths can be defined within the chamber, the flow paths being isolated from each other by the screw pump mechanism until the paths merge at, for example, the pump outlet. By isolating the fluid passing along one flow path from the fluid passing along the other, 10 pressure differentials between the first and second flow paths can be substantially maintained, and so any fluctuation in the pumping rate of one pump connected to the screw pump does not significantly affect the performance of the other pump connected to the screw pump. Thus, a single screw pump can be provided for backing simultaneously two secondary pumps, reducing the cost and size of the 15 footprint of a pumping arrangement for two process tools.

In a preferred embodiment, the inlets are located towards or at a low pressure side of the chamber, and a fluid outlet is located towards or at a high pressure side of the chamber. For example, the inlets may be formed in a common surface 20 defining the chamber, and may be located on a common plane, for example, substantially perpendicular to rotational axes of the shafts. Alternatively, or in addition, an inlet can be provided in a side wall of the chamber, thereby providing inter-stage porting.

25 Preferably, a first flow path is defined between the internal surface of the chamber and the external surface of the first rotor, and a second flow path is defined between the internal surface of the chamber and the external surface of the second rotor.

30 In a second aspect, the invention provides a pumping arrangement comprising a screw pump as aforementioned, a first pumping unit having an exhaust connected



to a first inlet of the screw pump and a second pumping unit having an exhaust connected to a second inlet of the screw pump.

Preferred features of the present invention will now be described, by way of example only, with reference to the accompanying drawing, which illustrates a cross-section of an embodiment of a screw pump according to the invention.

The pump 10 includes a pump body 12 having a top plate 14 and a bottom plate 16 defining a chamber 18 therebetween. First and second fluid inlets 20, 22 to the chamber 18 are formed in the top plate 14, and a fluid outlet 24 from the chamber 18 is formed in the bottom plate 16.

The pump 10 further includes a first shaft 26 and, spaced therefrom and parallel thereto, a second shaft 28 having longitudinal axes substantially orthogonal to the top plate 14 and bottom plate 16. Bearings (not shown) are provided for supporting the shafts 26, 28. The shafts 26, 28 are adapted for rotation within the chamber 18 about the longitudinal axes in a contra-rotational direction. One of the shafts 26, 28 is connected to a drive motor (not shown), the shafts being coupled together by means of timing gears (not shown) so that in use the shafts 26, 28 rotate at the same speed but in opposite directions.

A first rotor 30 is mounted on the first shaft 26 for rotary movement within the chamber 18, and a second rotor 32 is similarly mounted on the second shaft 28. Each of the two rotors 30, 32 are of generally cylindrical shape and has a helical vane or thread 34, 36 respectively formed on the outer surface thereof, the threads intermeshing as illustrated. The shape of the rotors 30, 32 and in particular the shapes of the threads 34, 36 relative to each other and to the inner surface of the pump body 12 are calculated to ensure close tolerances with the inner surface of the pump body 12.

30

In use, the exhaust of a first secondary pump, such as a turbomolecular pump, is connected to a first inlet 20, and the exhaust of a second secondary pump is

connected to the second inlet 22. Rotation of the pump shafts 26, 28 pumps fluid entering the pump 10 via the first inlet 20 to pass along a first flow path 38 defined between the internal surface of the pump body 12 and the thread 34 of rotor 30, and pumps fluid entering the pump 10 via the second inlet 22 to pass along a  
5 second flow path 40 defined between the internal surface of the pump body 12 and the thread 36 of rotor 32, the flow paths 38, 40 merging at the outlet 24 where the pumped fluid is exhaust from the pump 10 at or around atmospheric pressure.

By defining two flow paths 38, 40 isolated from each other by the rotors 30, 32  
10 until the paths merge at the pump outlet 24, pressure differentials between the flow paths 38, 40 can be substantially maintained, and so any fluctuation in the pumping rate of one of the secondary pumps does not significantly affect the performance of the other secondary pump. Thus, a single screw pump 10 can be provided for backing simultaneously two secondary pumps, thereby reducing the  
15 cost and size of the footprint of the pumping arrangement for two process tools.

In summary, the invention provides a dual inlet screw pump, in which a chamber defines with first and second externally threaded rotors respective fluid flow paths  
within the chamber. This can enable fluid entering the pump via the first inlet to  
20 be pumped substantially in isolation from fluid entering the pump via the second inlet.

**CLAIMS**

1. A screw pump comprising a chamber defining with first and second externally threaded rotors mounted on respective shafts and adapted for counter-rotation within the chamber a plurality of flow paths having respective fluid inlets.  
5
2. A screw pump according to Claim 1, wherein the inlets are located towards or at a low pressure side of the chamber, and a fluid outlet is located towards or at a high pressure side of the chamber.  
10
3. A screw pump according to Claim 2, wherein the inlets are formed in a common surface defining the chamber.
- 15 4. A screw pump according to any preceding claim, wherein the inlets are located on a common plane.
5. A screw pump according to any preceding claim, wherein the flow paths merge at a fluid outlet of the chamber.  
20
6. A screw pump according to any preceding claim, wherein a first flow path is defined between the internal surface of the chamber and the external surface of the first rotor, and a second flow path is defined between the internal surface of the chamber and the external surface of the second rotor.  
25
7. A screw pump according to any preceding claim, wherein the pressure at one of the inlets during pumping is higher than the pressure at another of the inlets.  
30
8. A screw pump substantially as herein described with reference to the accompanying drawing.

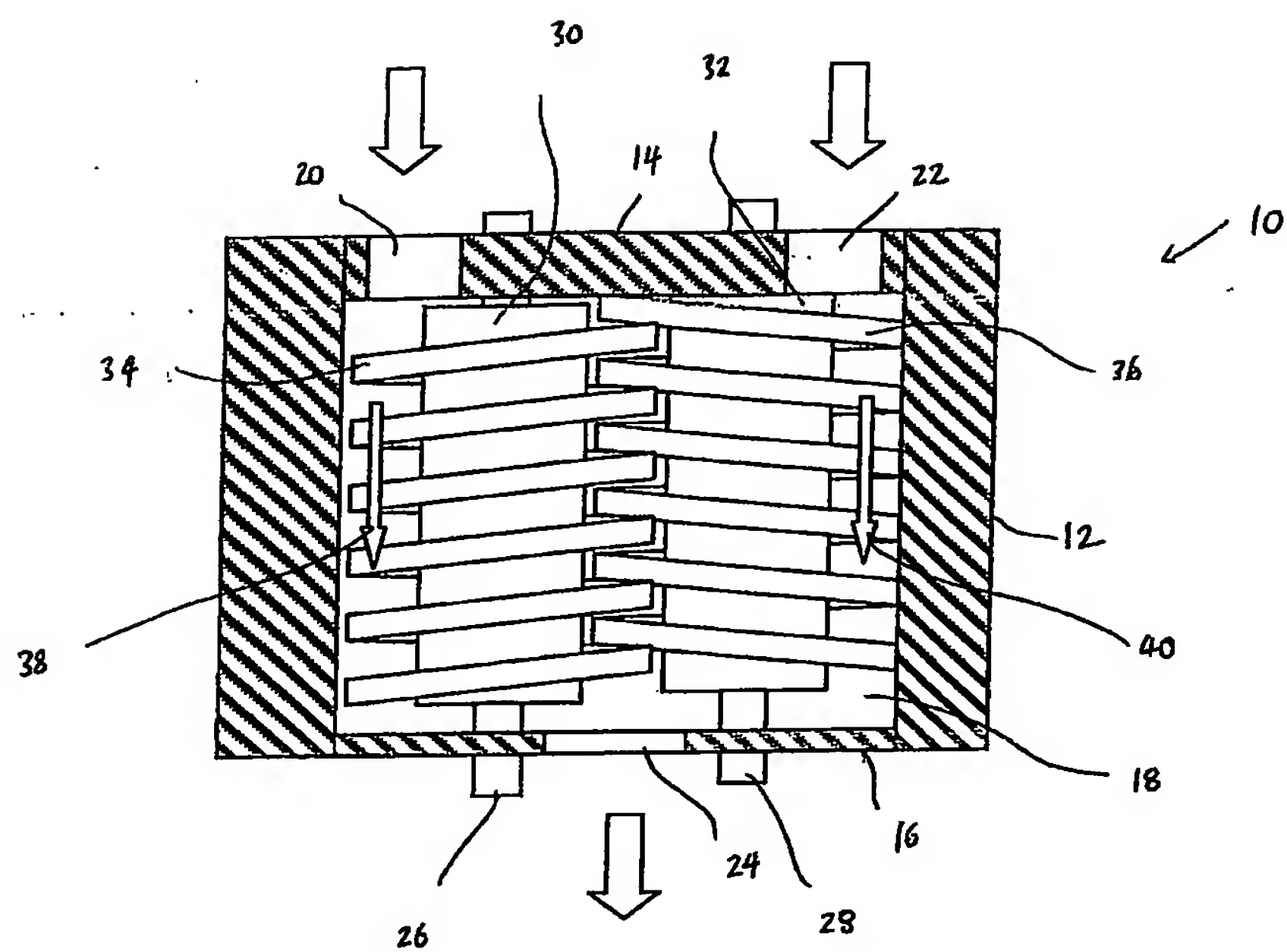


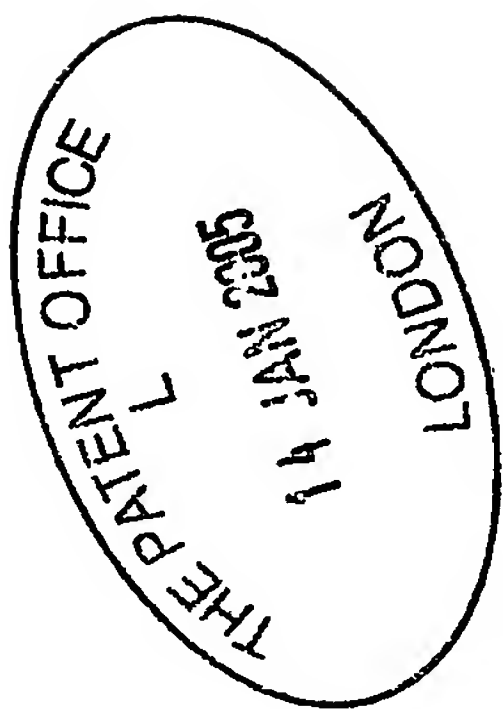
9. A pumping arrangement comprising a screw pump according to any preceding claim, a first pumping unit having an exhaust connected to a first inlet of the screw pump and a second pumping unit having an exhaust connected to a second inlet of the screw pump.

**ABSTRACT**

...The invention provides a dual inlet screw pump, in which a chamber 18 defines  
5 with first and second externally threaded rotors 30, 32 respective fluid flow paths  
within the chamber 18. This can enable fluid entering the pump via a first inlet 20  
to be pumped substantially in isolation from fluid entering the pump via the second  
inlet 22.

10 (figure 1)





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